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EDITORIAL.

THIS number of the *Journal* contains articles on an assortment of subjects, that on Coconut Notes being especially likely to appeal to coconut planters who are now, after many years, getting a reasonable price for their copra. The notes on copra grading show the percentages of the three grades recorded after examination at Suva and Levuka; they should be compared with the table given in the *Journal* for last December. A note which follows this article states that after 1st June Plantation grade copra grading certificates will show only the grade and not the number of marks awarded. For the Fair Merchantable Sundried (F.M.S.), however, the marks obtained will continue to be given so that the producer may see how far his copra falls short of Plantation grade.

His Excellency the Governor has now appointed the Fiji Copra Board to advise Government in all matters appertaining to copra and control arrangements for the purchase of all the copra in the Colony for the Ministry of Food. The Board personnel is as follows:—

The Director of Agriculture, Chairman; The Senior Agricultural Officer, Deputy Chairman; Mr. H. H. Vaskess; Mr. C. S. de C. Reay; Mr. W. V. Banting and Mr. C. W. Aidney, Secretary.

Interesting articles by the Botanist comprise one on climbing plants suitable for camouflage for sandy beach areas, for the zone between beaches and higher land and for both these areas. The wealth of plant material available for this purpose is surprising to one not accustomed to think of jungle products as raw materials. The same contributor has the first half of an article describing the useful timbers, fruits, leaves and other vegetable derivatives which would be of use to troops living in the jungle or engaged in guerilla warfare. The second portion will appear in our September issue and the complete article should be of great value, being in fact comparable with Horne's well known "A Year in Fiji", published in 1880.

Yet a third article by Mr. B. E. V. Parham is that on canes and bamboos suitable for basket-making by persons in the institutes for the blind. Here again one is impressed by the variety of material available so near us.

Four short articles by the Entomologist deal with a pumpkin beetle recently assuming pest status; further notes on lice and flies from the plumage of birds and fur of bats; new host records for a well-known timber white ant and some notes on the susceptibilities of different varieties of rice to the leaf-hopper *Sogata*.

Among the Agricultural Notes are articles on some common errors in rice planting, chiefly neglect of weeding and cultivation, both easily remedied to the cultivator's benefit. Improvement of pastures is bound to follow selective weeding with an absence of firing. The various methods of dealing with the commonest weeds are dealt with and comprise crushing by overstocking with cattle, cutting back thoroughly or uprooting.

In the list of Extracts are two interesting articles showing how slaked lime and sand with the admixture of brown sugar makes an excellent building material as does the so-called pisé de terre or rammed earth finished off with plaster. With the enormous demand for essential buildings these two types of material should prove useful to the person trying to economise in small buildings.

NOTES ON FOOD.

1. OUR LOSS IN WHITE BREAD.

Wholemeal means or should mean wheat ground to powder, that is to flour. It is all there, the whole of it; nothing is removed. The most important part of the grain is the embryo of the plant of the next generation. The rest of the grain, by far the larger part, is white flour. The bag which contains it is, when ground, the bran.

As for the white-bread eater, his third slice does not satisfy him, nor his fourth. He takes his fifth slice, as one takes another helping of plum-pudding, unwanted, in hope of finding the sixpence. Thus he eats ten per cent more than he needs, and condiments and conserves therewith, and yet misses that which is essential. The germ is essential, but it has gone to feed the pigs. The oil in the germ is rich in the principle that confers fertility and vigour, richer it is said than any other substance. None of that principle occurs in white bread. Yet true wholemeal is easy and cheap to produce and a flavour incomparable.

If you grind wheat in a coffe mill, which is very easy if the mill is a large one, good useful wholemeal results.

The vital principles in food, about which there is so much talk—" accessory food factors," " vitamins "—should not be regarded apart from one another. They do not occur in Nature isolated, and they should be used as they occur. It is useless to buy or exploit synthetic substances named with the letters of the alphabet and hope for a melody comparable with the orchestra of Nature. Wholemeal, 100 per cent, contains the whole orchestra. Freshness and wholeness of food are the basis of nutrition.

—Dr. L. J. Picton—" The Countrymen," April–June, 1941.

2. REFINED FOOD.

Much of our national illness is caused by crazes for food that is (1) white, (2) refined and (3) keepable. All three crazes are exemplified in white flour. The best food chemists are the earth and the sun, which produce the whole wheat that the steel rollers of the white-flour millers spoil. White flour makes white faces. The less original colour and goodness are refined out of a food, the more food value it retains. The original black sugar or once-refined dark brown sugar has more food value than much refined white sugar. A plague on all this refining, whether of food or of the speech that " refaines " High Street into Hay Street.

Wholemeal flour naturally does not " keep " because the germ in it is alive. Germless white flour " keeps " because it is as dead as portland-cement powder, all its original goodness having been rolled and sifted out of it. Let them " keep " their flour who have no care to keep their health.

The best way to ensure fresh wholemeal flour is to grind your wheat yourself, fresh for each baking, in a hand mill that clamps to the table and costs about £3.

—Geoffrey Bowles.

AGRICULTURAL NOTES.

1. COPRA GRADING.

THE following table is compiled from the grading returns of the Copra Graders at Suva and Levuka and shows the numbers of bag classed in each grade during the latter half of 1941 and for the first three months of 1942.

Place.	Month.	Total No. of bags persented for grading.	No. of bags.		Percentage.	
			Planta-tion.	F.M.S.	Planta-tion.	F.M.S.
Suva, 1941	July ..	4,733	3,133	1,600	66	34
	Aug. ..	6,084	1,679	4,405	27	73
	Sept. ..	9,379	2,869	6,510	31	69
	Oct. ..	2,689	1,408	1,281	52	48
	Nov. ..	10,319	6,834	3,485	66	34
	Dec. ..	5,179	3,809	1,370	74	26
Levuka, 1941	July ..	5,000	1,975	3,025	39	61
	Aug. ..	2,755	590	2,165	21	79
	Sept. ..	3,581	1,165	2,416	32	68
	Oct. ..	1,796	1,235	561	69	31
	Nov. ..	4,997	2,231	2,766	45	55
	Dec. ..	7,910	2,865	5,045	36	64
Total for 6 months ..	....	64,422	29,793	34,629	46	54
Suva, 1942	Jan. ..	2,399	798	1,601	33	67
	Feb. ..	5,423	4,816	607	89	11
	March .	3,919	3,369	550	86	14
Levuka, 1942	Jan. ..	4,917	1,870	3,047	38	62
	Feb. ..	3,625	1,829	1,796	50	50
	March..	7,837	1,298	6,089	18	82
Total for 3 months ..	....	27,670	13,980	13,690	51	49

—C.H.

COPRA GRADING.

IT is notified that as from the 1st June, 1942, Grading Certificates in respect of parcels of copra graded as Plantation grade will show the grade only and *not* the number of marks awarded. Certificates in respect of copra which is graded as F.M.S. will continue to show the marks obtained in order that the owner and producer may see in what respect his copra falls short of Plantation grade.

H. W. JACK,
Director of Agriculture.

2. OBSERVATIONS ON PASTURE IMPROVEMENT.

By

W. L. PARHAM,
Agricultural Assistant.

Recently a very interesting article on pasture improvement appeared in the *Malayan Agricultural Journal*(1). The writer dealt with the facts difficult to overcome that in padi growing districts " demands on animal labour are heavy " whilst every padi season the cattle have to be kept off the padi lands which during the rest of the year provide valuable pasture. The problem was attacked by the " Notification " of " Cattle Grazing Reserves " where " the land remains the property of the State, and no charge is made for its use as grazing land."

The idea of such reserves was of some interest to the present writer as at the Dobuilevu and Waimaro Settlements he has tried to foster reliance by the settlers on a common pasture.

A promising idea mentioned in the article is the development of " sterile " lands for use as pasture in the wet season when padi lands cease to be available.

The Malayan experiments showed carpet-grass (*Axonopus affinis*) known in Fiji as "*Paspalum compressum*" to be " outstanding, and a great improvement over the local grasses . . . . . Since 1936 carpet-grass has been the standard for planting on the inland foothill reserves." As regards Fiji it is interesting that some European dairymen in Tailevu favour carpet-grass for hills and that in Ra on an experimental pasture plot at Dobuilevu Demonstration Farm it has been found that stock seek out the carpet-grass in a marked way.

Considering that in Fiji the Department of Agriculture is obtaining success by prohibiting fires it is interesting to find that in Malaya the burning of trees and other material is done. Here at the Demonstration Farms at Dobuilevu and at Waimaro trial is being made of selective clearing to obtain the clearing even of forest land without the need to resort to burning. The wholesale cutting of unwanted trees and plants so litters up the ground that burning becomes necessary to permit grass to grow. To avoid the necessity for fires, clearing is done progressively so that the ground is always reasonably clear. At the first clearing only knife work is attempted and the object is to cut undergrowth and weeds. At subsequent clearings trees are cut where necessary to remove excessive shade but useful trees and those desireable for shelter or for protection from erosion of steep hills are left. At Dobuilevu the heaviest clearing has been of guava (*Psidium Guajava*) and of the indigenous Molau (*Glochidion seemanni*) which has been observed to seed and germinate freely on grazed lands. At Waimaro there is forest to be cleared but as on some of the local dairy farms it is found possible to spare many trees. In particular at Waimaro every effort is made to keep the ground as clear as possible by stacking fallen material as contour breaks. Of course there is the additional intention that the contour breaks will conserve soil.

Other points of interest in the Malayan article are that the clearing and grassing were found to necessitate sixty-seven labour units per acre. For maintenance a patrol gang was found necessary at the rate of one man to twenty-five acres all the year round.

Having referred to work done in Fiji at the Dobuilevu and Waimaro Demonstration Farms it is advisable to state that these farms are designed particularly to assist the small-holder and are therefore worked at low cost so as not to demonstrate what is possible only to a capitalist. It is particularly important not to experiment at such farms so work done is usually the result of observations of sucessful work done elsewhere. The writer is particularly indebted to progressive European dairy-farmers whose success has shown the way in many directions. At the Demonstration Farms it is desired to utlize all methods observed to be successful. A case in point is the harrowing of pastures in order to spread manure. The value of harrowing has been accepted for years and common opinion is merely being confirmed by making harrowing a regular practice where possible on the Demonstration Farms.

Though at Waimaro a start is being made at establishing a new pasture, free in the early stages from the complication of its being grazed whilst in formation, most of the experience at the Demonstration Farms has been with the improvement of pastures fully stocked with cattle. This has caused weeding to take first place and summarized below are the conclusions reached as to the practical ways of dealing with undesirable plants—

Gasau reed (*Miscanthus japonicus*)—crush by overstocking.

Solanum (*Solanum torvum*)
Guava (*Psidium Guajava*)
Koster's curse (*Clidemia hirta*)
Molau (*Glochidion seemanni*)
Lantana (*Lantana crocea*)
Qatima (*Urena lobata*)
} cut persistently.

Tar-weed (*Lythrum hyssopifolium*)
Mint-weed (*Hyptis pectinata*)
Blue rat-tail (*Stachytarpheta jamaicensis*
Tobacco-weed (*Elephantopus scaber*)
Milk-weed (*Asclepias curassavica*)
} uproot.

At the time of writing the following pasture plants are being utilized: Guinea grass (*Panicum maximum*), *Paspalum dilatatum*, *Paspalum galmarra*, Carpet grass (*Axonopus affinis*), *Centrosema pubescens*, and Elephant grass (*Pennisetum purpureum*). Of these the legume, *Centrosema pubescens*, is a fairly recent introduction by the Department of Agriculture. It has proved itself able to survive competition with Para grass (*Panicum barbinode*) and at Korovou orchard the results from grazing mixed Para and *Centrosema* are being watched. In 1941 the Department introduced *Desmanthus virgatus* and trials at Korovou have shown it to be palatable to stock but its shrubby habit in the wet zone may make it undesirable.

The above notes do not pretend to be exhaustive on the subject but merely indicate that within the scope of the Demonstration Farms efforts are made to utilize the results of experience from work done both in this Colony and overseas.

To quote a writer on "plant ecology" the endeavour is to have "the principles of plant succession applied with the master factor being grazing"(2).

Acknowledgments.—A number of the identifications of plants mentioned are the work of the Botanist. The references below include those which have had a bearing on work done though not actually referred to in the text.

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(6) Parham, B. E. V., Notes on Weeds in Fiji, 2, Vol. 10, No. 1, 1939.
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3. ERRORS IN PADI PLANTING.

By
W. L. PARHAM,
Agricultural Assistant.

FIJI is now largely dependent for rice on the padi-growers within the Colony and it is urgent that yields from existing padi-fields be increased wherever possible. There are expert padi-growers who by energy and skill obtain excellent crops but below are set out briefly some of the remediable but common errors which observation shows causes many disappointing yields.

Weeding.—There is a widespread neglect of weeding and the writer agrees with the opinion of Mr. W. T. Gatward of Tailevu that many padi crops are ruined by this neglect. As a landlord to many padi-growers Mr. Gatward has taken an interest in the crop over a long term of years. The following was a typical example in the writer's experience. At some inconvenience, seed of a special upland padi was supplied to an applicant but a follow-up inspection showed that the seed had been sown on roughly ploughed cane-land where the padi had to compete with weeds and surviving cane. Weeding is easier in the case of wet-land padis so dry-land padis are the worst sufferers from neglect of weeding, but where wet-land padis are grown as a rain-crop a dry spell often causes the padi to be smothered by weeds.

Cultivation.—It is essential in the case of dry-land (upland) padis that the ground be prepared thoroughly; three ploughings are not too much. Unfortunately the standard of much of the ploughing done in Fiji is bad, and worse still the inexpert agriculturist regards a padi with a reputation for hardiness, such as Golden Californian (Sonacalif), as being capable of surviving the most careless treatment.

Soil Fertility.—The conservation of soil fertility by protection from erosion and leaching is little understood, and in addition the agriculturist lights fires on his fields to destroy what humus remains. The contoured fields at Dobuilevu Demonstration Farm in Ra are showing the value of the prohibition of burning and the protection of the soil by contour breaks and by cover-crops.

Irrigation.—At the time of writing (early May), crops which showed great promise a month ago are failing for want of rain in the dry zone whilst in the wet zone mature crops are being lost from the difficulty of harvesting in continuous rain. Dependence on rain is an ignorant attitude in a country where numerous streams and hillside springs permit of primitive irrigation works within the reach of many who continue to grow padi as a rain-crop.

SOME USEFUL PLANTS OF THE FIJI ISLANDS.

By
B. E. V. PARHAM, M.A.
Agricultural Officer (Plant Pathology).

PART I.

In recent months there has developed a need for information regarding the uses to which local plants can be put for a variety of purposes, especially in times of emergency.

The following notes have been compiled at the suggestion of the Senior Agricultural Officer (Mr. C. Harvey)—in as brief a form as possible and do not include references to many introduced economic plants, with the uses of which the reader is no doubt familiar.

Attention is drawn to as many species as possible that have a practical significance whether for use as food, building material, fuel or cover. Reference is also made to a limited number of poisonous plants which may be encountered in the course of any sojourn off the beaten track; and an occasional mention is made of plants which, although themselves of little use, so closely resemble useful species as to be prone to be mistaken for them.

The possibility of providing illustrations with the article being out of question, it may be mentioned that photographs and illustrations of some of the plants listed are available for loan to those interested—and the writer would be pleased to confirm the identification of any plant material sent in.

I.—FOOD PLANTS.

1. Roots and Tubers.

These include the many varieties of Yam, Dalo or Taro and other aroids, Kumala or Sweet Potato and other root crops generally cultivated throughout the group. Some species occur in a wild state.

All these roots may be cooked by boiling, steaming or baking: but are probably best baked or steamed in their skins.

(1) *The Yams* (*Dioscorea* spp.)—*Fam. Dioscoreaceæ.*

These are the true yams.

The plant behaves as a climbing annual above ground but carries on from one year to the next by means of underground storage tubers from which twining stems grow during the spring (July–August). The tubers contain starch and many kinds of yam are edible when cooked. The following are the common species found locally:—

(*a*) *Dioscorea alata* Linn.—The common cultivated yam—native name "uvi"—Hindi name "ubi," sometimes found wild. This species is characterized by a climbing 3 to 5—angled or winged stem without thorns and usually without aerial tubers. The leaves are opposite, broadly spear shaped or almost heart shaped about 6 inches long by 3 broad, with 5–9—nerves, apex pointed, base usually heart shaped.

The tubers are usually borne singly, are large, simple or branched, sometimes long, bottle shaped or short and rounded. The flesh is white or red, the former being regarded more highly. The crop matures in April and May—and during July and August wild yams are found in the forests and grasslands—especially in the dry zone—being easily recognized by the young shoots springing up at that time. Wild yams may be six feet or more long. There are a great many varities cultivated.

(*b*) *D. esculenta* (Lour) Burkill—the smaller yam—Native name " KAWAI."

This species differs from the last in the round wiry stems, the alternate round heart shaped leaves and short spines with which the stems are armed. The tubers are numerous, small and spindle shaped or oblong with pale brown smooth skin. When cooked the skin peels off like the bark of the birch tree—the flesh is very white and has the appearance of a good potato.

Cultivated throughout the Colony, but principally in Macuata and other parts of the dry zone. Roots mature in June.

(*c*) *D. nummularia* Lour. A wild yam, Native name " TIVOLI."

The stem is spiny at the base, the leaves are opposite, 5 nerved, oval with a finely pointed apex, the base heart shaped.

The roots which are long, cylindrical and covered with small rootlets are edible—and often used for food by Fijians engaged on forest work.

(*d*) *D. pentaphylla* Linn.—Native name " BULOU " (Vanua Levu); " KAILE TOKATOLU " (VITI Levu).

A far climbing plant with comparatively thick smooth round stems, readily distinguished from other yams by the 5 divided leaf and by the smooth round tuber with a light skin resembling a new potato.

Occasionally cultivated but common in a wild state especially in Bua and Macuata Provinces (Vanua Levu).

(*e*) *D. bulbifera* Linn.—Native name " KAILE " or " KAILE GAGA," also called "Air potato " or " potato yam."

A common vine with smooth wiry round stems, bearing small aerial tubers in the leaf axils. Leaves broadly heart shaped with a sharp apex—9-nerved.

The tubers are small, hairy, and very bitter and poisonous when raw. They are not commonly eaten unless after the acrid poisonous principle has been removed by washing in running water for a number of days. Used only by natives in times of scarcity.

Key to Yam species :—

Stems unarmed:—	
Winged (4-angled)	*D. alata.*
Cylindrical	*D. bulbifera.*
Stems prickly:—	
Leaves opposite	*D. nummularia.*
Leaves alternate—	
Entire	*D. esculenta.*
Digitate	*D. pentaphylla.*

(2) *The Aroids* (*Colocasia and other genera*), *Family Araceæ.*

There are a number of plants of this family which provide esculent roots or corms as " dalo," " via," and " dalo ni tana "—and the leaves of some form an excellent substitute for spinach if prepared in the correct way.

The plants are all large herbs with fleshy stalks and large peltate or arrow head leaves—not unlike an Arum lily in general appearance.

The corms and sap of all species contain a poisonous principle which is more marked in some (e.g. " via ") than in others. The leaves and corms contain crystals of calcium oxalate which is soluble in water and disappears on cooking. All roots should be cooked before eating.

(*a*) *Colocasia antiquorum*—Native name " DALO "—also known as " TARO " (the Tongan name).

This is one of the most important root crops grown in the tropics—and there are some 80 varieties listed in Fiji alone.

The Fijian varieties are all characterized by the peltate leaves borne on stout petioles arising from the crown of the corm—some occasionally bear flowers on axillary peduncles.

The crop is grown both in irrigated terraces or ponds (especially in the dry zone and in Kadavu) or under dry-land cultivation in the wet zone.

The corm is eaten cooked after boiling, baking or steaming, preferably in the skin. Leaves and petioles cooked as vegetable.

(*b*) *Xanthosoma sagittifolium* (Linn.) Schott. Native name "DALO NI TANA."—An introduced plant native of tropical America and West Indies where it is known as "tannier" or "yautia." Both cultivated and wild. Sometimes confused with "dalo."

The plant is erect, often four feet high and is easily recognized by the bloom on the stems and by the strongly-ribbed hastate leaves with a conspicuous intra-marginal vein. The flower is yellow.

More than one corm is produced and these are elongate and sheathed with scales—the outer skin has a pink colouration and the flesh has better keeping qualities than the "dalo."

It is claimed that this root is more wholesome than those of "dalo" and more palatable. The leaves also make excellent spinach.

Distribution: Commonly cultivated by Indians, occasionally by Fijians, and often wild along stream banks.

Cultivated in the wet zone. Prepared for food in the same way as "dalo."

(*c*) *Cyrtosperma edulis* Schott., Native name "VIAKANA."

This aroid is commonly cultivated in the Rewa Delta, where it also occurs in a semi-wild state.

It is characterized by the smaller and narrower olive green hastate leaves, with acute lobes, and by the erect rather than procumbent root-stock or corm.

The corms are generally boiled or baked.

(*d*) *Alocasia indica* (Roxb.) Schott. Native name "VIA" or "VIA GAGA"—also called "giant taro."

This plant grows in river banks and damp places—often attaining twelve feet in height. The leaves are large, 2-3 feet long, shining pale green on petioles four feet long or more. The ribs are prominent below. The plant emits an unpleasant smell—and the acrid sap may cause severe pain if it should touch the eyes.

The large perennial corm is hardly edible and certainly not without prior treatment.

The plant is best regarded as poisonous.

Distribution: Common in low lands.

(3) *Kumala or Sweet Potato.*

Ipomœa batatas (Linn.) Lam. (Fam. *Convolvulaceæ*). Native name "KUMALA."

This well known plant is widely cultivated and many varieties with white, yellow and red skin and flesh are to be found.

The plant is a perennial procumbent creeper or vine—the stems spreading rooting at the nodes. The leaves are various in shape from the rounded, heart shaped, simple leaf of the common red-skin variety to the much divided leaf of the white variety—"MAKUSI VULA." The tubers are numerous and of various shapes—generally spindle shaped, oblong or ovate. These are a nutritious food and may be prepared in a number of ways.

Distribution: Cultivated throughout Fiji; rarely growing wild as an escape or on abandoned garden sites.

(4) *Tapioca or Cassava.*

Manihot utilissima Pohl. (Fam. *Euphorbiaceæ*). Native name "TAVIOKA" or "KASAVA"; Hindi name "KASERA."

This introduced shrub is well known. The erect stems attain a height of six feet or more and are marked by the raised leaf scars left by the falling leaves.

The leaves are palmately divided and borne on the upper third of the stems.

The long tuberous roots are an important source of food—having a high starch content. The sap also contains a glucoside poison, produced by an enzyme, but this disappears on cooking or washing.

This poison is principally in the outer skin of the "sweet" types, but is distributed through the roots of the "bitter" varieties.

The starch extracted in water from the grated root is pressed through a fine sieve and heated to form the granulated product known as commercial tapioca.

Locally the roots are commonly used for food after being boiled or baked.

Distribution: Cultivated throughout the group, and occasionally growing wild.

(5) *Minor Roots.*

(*a*) *Dracæna* (*Tætsia*) *terminalis* Kunth. Native name "MASAWE," "VASILI" or "QAI."

A native shrub—similar to the well-known garden ornamental plant *Dracæna*.

The stems are erect arising from a large tuberous rhizome—and bear a crown or rosette of large oblong-lanceolate leaves, 24 inches long and 5 or 6 inches wide.

The large root is baked and eaten.

(*b*) Fijian Arrowroot:—

Tacca pinnatifida Forst (Family *Taccaceæ*). Native name "YABIA."

This plant is a stemless perennial tuberous herb with basal leaves 2-3 feet long, leaf blades palmately 3-divided or pinnatifid spreading.

Flowers borne on a basal erect stem, in clusters with curious filiform bracts.

The tubers are globose, flattened with pale yellow skin and white flesh.

The starch which is extracted by grating and washing the roots is of excellent quality and has a local reputation for use in convalescent diet, and for dysentery patients, etc.

Distribution: Common along beaches and in open reed country throughout the Group.

(6) *Food values of some Root Vegetables.*

For purposes of comparison the following analyses are given, the authorities being indicated by the reference number given in the first column:—

Name.	Common name (Fiji).	Protein.	Carbohydrate.	Fat.	Fibre.	Mineral.	Colorific Value per 100 grm.
		%	%	%	%	%	
Dioscorea alata (1)	YAM, UVI ..	1·73	25·43	·03	·62	0·96	108·9
Xanthosoma saggitofolia (2).	DALO NI TANA .	1·1	25·6	0·2	0·5	0·133	111
Ipomœa batatas (2)	KUMALA . ..	1·4	15·99	·22	·17	1·21	71·5
Manihot utilissima (1) ..	TAPIOCA . ..	·81	29·63	·58	·71	0·44	127·0
Artocarpus communis (1) ..	BREADFRUIT UTO.	1·94	21·95	·51	1·11	0·79	100·0

2. Green Vegetables and Food Crops.

Under this heading are included notes on common indigenous and introduced plants which are used as vegetables—the temperate climate vegetables are not listed.

(1) *Leafy Green Vegetables.*

There are many leafy plants, both wild and cultivated which are commonly used for food.

Generally speaking the young leaves, shoots or fronds are used, cooked in a small quantity of water and garnished with milk made from grated coconut. The commoner species are dealt with first.

"Rourou" is the general Fijian name for leaves of "dalo" and other aroids used as spinach of which the following are the more important.

(*a*) *Dalo leaf*, especially the young leaves of the "Tausala" varieties is one of the best of local greens—having a good content of Vitamins A and C. It must be properly cooked (with a change of water) to ensure the removal of the calcium oxalate crystals which otherwise cause irritation.

(*b*) *Dalo ni tana*—the leaves are used in the same way to make a "rourou" which is darker in colour and less acrid than that prepared from "dalo" leaves.

(*c*) *Kumala tops.*—The young shoots of *Ipomœa batatas* and of the semi-aquatic creeper *I. aquatica* (Fijian name "wakumala," Hindi name "karamua) make good spinach, the Vitamin A content being excellent as indicated(2)

	Kumala.	*Wakumala.*
Vit C. mg/100g.	73·8	51·7
Carotene (expr. as Vit. A) I.U./100g	7700	14,000

(*d*) Tapioca leaves are used in the same way and are known to be one of the richest source of Vitamin C. and also rich in calcium.(5)

(*e*) "Bele" (*Hibiscus manihot* L.) is a shrub widely grown by Fijians and usually interplanted in dalo and yam gardens.

The plant is a perennial, about 6 feet high with fleshy green variously lobed leaves and large yellow flowers very similar to those of cotton or *Hibiscus*.

The young leaves and shoots are commonly cooked and eaten as a relish for dalo and other carbohydrate foods—the mass is very mucilaginous and probably has a laxative action.

(*f*) "Poi" (*Basella alba* L. Fam. *Basellaceæ*) also known as Indian or country spinach is a cultivated twining vegetable with fleshy rounded leaves. The young shoots and leaves when cooked closely resemble true spinach.

(*g*) *The Edible Ferns.*—"Ota" (*Athyrium esculentum*); and other species as "ota balabala" (*A. maximum*) "ota lalabe" (*A. accedens*) "ota kalasei" (*Coniogramme fraxinea*) and "ota loa" (*Tectaria latifolia* and *T. decurrens*) are all ferns growing wild in shady woods and along stream banks. The first-named is a widely known vegetable of good quality as shown in the analyses available.(2)

Other edible ferns are as follows:—"launikoli" (*Histiopteris sinuata*); "midri" (*Stenochlæna palustris*), the common climbing fern, and "boreti" (*Acrostichun aureum*) the common fern of mangrove swamps.

The very young fronds are used and those of "ota" are commonly on sale at the weekly bazaars.

(*h*) *Edible Weeds* :—Many weeds of cultivated lands are used locally and in other tropical countries in the place of spinach. The best of these are *Amaranthus gengeticus* (Family *Amaranthaceæ*), Native name "TUBUA." Hindi name "chauraya"; *Solanum nigrum* L., Native name "BORO NI VEI WERE." *Capsicum frutescens* L. (fam. *Solanaceæ*)—the bird's eye chili or "ROKETE"; and *Portulaca oleracea* L. (Family *Portulacaceæ*) Native name "TAUTUKUNUVUAKA," widely distributed in the Pacific islands and commonly known as "pig weed." The violet-leaved marsh pennywort (*Centella asiatica* L.) is a common food in the East and the analysis shows it has good quality, being rich in iron and fair in Vitamin C.

(*i*) *Trees* with edible leaves and flowers:—Several trees provide useful spinach—some are cultivated by Indians as the horse-radish tree (*Moringa oleifera*) and *Sesbania grandiflora* Hindi name "AVITIMARO." The pods and leaves of the former—and the flowers of the latter are eaten. The Vitamin A content of the latter is particularly high.

Among the native trees are, "KURA" (*Morinda citrifolia* Forst), with greyish-white edible fruits and edible young leaves and shoots, and the "SIKAU" (*Gnetum gnemon* L., Family *Gnetaceæ*) which is commonly found in the forests of south-western Vanua Levu and south-eastern Viti Levu. The young leaves and shoots are eaten as a vegetable and the fruit are a useful food.

(2) *Miscellaneous Food Plants.*

(*a*) *Inocarpus edulis* Forst. (Family *Leguminosæ*) Native name "IVI"—common name Tahitian Chestnut is a large tree easily recognized by the buttressed trunk and flat surface roots and by the large kidney-shaped green fruits. These contain a large nutty kernel covered with a tough fibrous coat—and are in season during May, June and July.

The kernels are usually cooked by roasting the whole fruit or by boiling them after they have been husked.

(*b*) Breadfruit (*Artocarpus communis* Forst. Family *Moraceæ*) Native name "UTO"—is a handsome tree of medium size with large variously divided leaves. The fruit is well known as a vegetable, is better baked than boiled and is a valuable source of food at all times. Season lasts from February to June or July.

(*c*) *Barringtonia edulis* Seem. (Fam. *Lecythidaceæ*) Native name "VUTU KANA." A tall tree with large glossy leaves and pendulous racemes of white or pink flowers. The fruit is a nut, ovoid in shape with a large edible kernel.

The species should not be confused with *B. speciosa* ("VUTURAKARAKA") a spreading seaside tree—whose large square fruits are regarded as poisonous and used as floats for fish nets.

(*d*) A seasonal native vegetable is the "DURUKA" (*Evianthus maximus* var.)—a wild type or sugar cane very common in swampy places everywhere. During late April and May the unopened flower buds are gathered for food. The young inflorescence at this stage is a cylindrical mass of soft tissue which when cooked is a very nutritious and palatable food.

(*e*) The seeds of another wild grass,—*Coix lachrymajobi* L., Native name "SILA," are not generally used locally—although in Ceylon and elsewhere they are regarded as a useful cereal, having a higher protein content than rice.

(*f*) The fruit of the coconut palm ("NIU") is a well known source of food at all stages of development and the apple formed in the germinating nut is also edible, both raw and cooked.

(*g*) The "SOU" or "BOROSOU" and "SOU BOKOLA" are species of *Solanum*—the fruits resembling those of the tomato. Commonly grown in upland villages, the fruits are generally used in stews and also for preserves.

(3) *Food values of Green Vegetables.*—(2)

Name.	Common name (Fiji).	Protein.	Carbohydrate.	Fat.	Fibre.	Mineral.	Calories Value per 100 grm.
		%	%	%	%	%	
Colocasia antiquorum (leaf)	ROUROU	3·4	7·8	·1	1·1	·114	47
Ipomoea batatas	KUMALA	2·5	1·3	·2	1·1	·188	17
Manihot utilissima	TAPIOCA	6·6	4·8	1·1	1·9	..	57
Basella alba	POI	1·6	2·9	·1	·3	·288	19
Athyrium esculentum	OTA	1·6	5·5	·2	1·3	·337	31
Stenochlæna palustris	WAMIDRI	2·4	3·7	0·1	2·5	·086	26
Portulaca oleracea	TAUTUKUNI-VUAKA.	2·5	8·0	0·2	2·0	·241	35
Morinda citrifolia	KURA	3·9	2·2	0·6	3·0	·345	31
Gnetum gnemon	SIKAU	5·1	4·5	·4	3·8	·526	43
Carica papaya	PAPAW, WELETI	5·6	5·3	0·4	1·0	·479	30
Sesbania grandiflora	AGATHI	8·4	9·4	1·1	2·4	·382	84
Moringa oleifera	MURANGAKAI	9·1	9·6	2·0	1·2	·654	95
Centella asiatica	TOTODRO, TIN-PATIA.	2·89	8·63	0·34	1·79	2·09	49

(4) *Vitamin content of some Green Vegetables.*

Name of reference.	Common name (Fiji).	Vit. C. mg/100g.	Vit. A. I.U./100g.	Place recorded and reference.
Colocasia antiquorum (leaves)	ROUROU	31–37	14,200–16 500	Malaya [2].
Colocasia antiquorum (stalk)	BABA	5	180	,,
Ipomœa batatas (leaves)	KUMALA	73·8	7,700	,,
I. aquatica (leaves)	WAKUMAIA	51·7	14,000	,,
Manihot utilissima (leaves)	TAPIOCA	145–185	13,000	E. Africa [5].
Carica papaya (young leaves)	PAWPAW	38·6	28,900	Malaya [2].
Basella alba	POI	28·9	3,100	,,
Athyrium esculentum (young fronds).	OTA	39·6	2,250	,,
Stenochlæna palustris (young fronds).	WAMIDRI	42·8	8,700	,,
Amaranthus viridis	TUBUA	42	10,000	,,
Portulaca oleracea	TAUTUKUNI VUAKA.	14	4,900	,,
Centella asiatica	TOTODRO.	57	7,500	,,
Moringa oleifera (pods)	....	92·8	7,900	,,
Sesbania grandiflora (leaves)	AGATHI	181	22,000	,,
Gnetum gnemon (leaves)	SIKAU	24	9,500	,,

3. Fruits.

(1) *Common Edible Fruits.*

There are comparatively few indigenous fruit trees, but a number of introduced species have become naturalized and are common throughout the more open country and in the sites of old village gardens.

The best known are the following:—

(*a*) *Eugenia malaccensis* Fam. *Myrtaceæ*, Native name "KAVIKA," commonly known as Malay apple. A large tree with glossy dark green foliage and abundant red blossoms often produced directly on the larger branches. The fruit is a succulent berry about 2 or 3 inches long and 1 to 1½ inches in diameter. The flesh is white or rose pink, very juicy and of a pleasant rose-water flavour.

(*b*) *Eugenia jambos* Linn. Native name "KAVIKA NI IDIA" or rose apple is a small spreading tree, generally growing near habitations. The leaves are smaller than those of the "kavika" and the flowers are white. The fruit is globular about 1¼ inches in diameter, with similar flavour to the above.

(*c*) *Pometia pinnata* Forst. (Fam. *Sapindaceæ*), Native name "DAWA". A large tree with buttressed trunk and pinnate leaves the young leaves shewing a characteristic pink flush. The flowers are small and green, and the fruit globular, over an inch in diameter. The outer skin is about 1/10th inch thick and the flesh within gelatinous white, surrounding a large seed. The fruits are in season during March and April.

(*d*) *Spondias dulcis* Forst. (Family *Anacardiaceæ*) Native name "WI"—also known as Otaheite Apple.

A large tree with rough warty bark, attaining a height of 60 feet or more. The pinnate leaves clustered near the branch ends are 8 to 15 inches long, leaflets 11 to 13 in number, about 3 inches long. Flowers small in large panicles. The fruits are oval to oblong, 2 to 3 inches long resembling a large plum, yellow when ripe. The yellow pulp is firm and juicy, varying from acid to sweet in flavour. The seed is beset with numerous spines.

Distribution: Common in low lands and on old village sites.

(*e*) The *Citrus* group (Fam. *Rutaceæ*) Native general name "MOLI". many fully naturalized and common.

The mandarin, sweet orange, and lime are generally cultivated; and are too well known to require further description. The Seville or bitter orange is used for preserves only.

Growing wild are the rough lemon (Native name "MOLI KAROKARO") the shaddock ("MOLI KANA") and an inedible wild species in Vanua Levu known as "MOLI SOCO." The shaddock bears large fruit often 9 inches in diameter with a thick skin and dry flesh generally lacking in flavour, although quite edible.

(*f*) Pawpaw or Papaya—(*Carica papaya* L.—Fam. *Caricaceæ*) Native name "OLETI," "WELETI" or "MAOLI"— is fully naturalized and the fruit is cooked when green as a vegetable or used fresh when ripe. The plant is easily recognized by the straight succulent hollow stem crowded by large palmately-divided leaves and by the fruit which are borne close to the stem in the axils of the leaves.

Distribution: Widely cultivated and occurring in a wild state nearly everywhere.

Other native trees of minor importance are the " WACIWACI " (*Sterculia vitiensis*), a very tall forest tree with large palmately divided leaves and large woody capsules containing a number of oily nuts of excellent flavour; the " TARAWAU " (*Dracontomelon sylvestre*), a large tree with pinnate leaves and hard, somewhat unpalatable green fruits the size of a large marble; " TOMI-TOMI " *Xylosoma* sp., a seaside shrub with plum-like fruits and finally the " KURA " (*Morinda citrifolia*) with white potato-like fruits and the " SIKAU " with small berry-like fruits with an edible seed.

(*g*) *Introduced Fruits.*—Among introduced fruit trees fully naturalized the most important is the guava (*Psidium guajava* L.) which has spread far and wide throughout the Colony and which produces large quantities of excellent fruit during the months January to March.

The plant is usually a large shrub. The foliage light green, the leaves oblong—elliptic; 3 to 6 inches in length, the branchlets are 4-angled.

The flowers are white, borne singly or 2 or 3 together and the fruits which contain many stone-like seeds vary greatly in size and shape, and possess a characteristic odour. The fruit is an excellent source of Vitamin C.

Another common introduced tree is the Jakfruit (*Artocarpus integer* Merr.) or Indian Breadfruit with small leathery leaves and large rough-skinned usually oblong fruits borne on the main trunk and the larger branches. The flesh of the fruit is edible but not very palatable—the seeds may be roasted and eaten as chestnuts.

Bananas are often found in a naturalised state—there is one indigenous species *Musa Fehi* (Native name " SOAQA ")—found in upland forests—and characterized by the erect bunch of large orange-red fruits which are best eaten after being cooked.

Green bananas may be cooked and eaten as a vegetable; and plantains are almost always cooked before being considered edible.

The mango is most productive in the dry zone, and the passionfruit is most prolific at the higher elevations, although the bell apple bears well on Ovalau Island, and the granadilla and hard-shelled passion fruit do well at sea level.

(2) *Vitamin C. Content of some Local Fruits.*

Name.	Common name in Fiji.	Vitamin C. (Ascorbic acid) mg./100g.	Place of record and reference.
Psidium guajava	GUAVA	300–450	India, Hawaii (4).
Carica papaya	PAWPAW	61	Ceylon (1).
Ananas comosus	PINEAPPLE	55·4	Fiji (3).
Citrus sinensis	ORANGE	70·4	"
C. paradisi	GRAPEFRUIT	36·3	"
C. nobilis	MANDARIN	45	Ceylon (1).
C. limonia	LEMON	24·5	Fiji (3).
Spondias dulcis	WI	42	Ceylon (1).
Lycopersicum esculentum	TOMATO	27	"
Artocarpus integer	JAK	7	"
Cocos nucifera	YOUNG COCONUT	3·1	"
Persea americana	AVOCADO PEAR	Trace.	"

(To be concluded.)

ENTOMOLOGICAL NOTES.

By

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1. THE PUMPKIN BEETLE, *Aulacophora*.

Pumpkins, cucumbers and marrow leaves are prone to attack throughout the Colony by two or three species of beetles, popularly but erroneously called ladybirds. The chief pest is *Aulacophora coffeæ* Hornst. measuring 3/10 of an inch in length and orange-yellow above and black beneath. Less serious is *A. quadrimaculata* F. measuring only ¼ inch and with four black spots on a yellow background. This small beetle seems common in Lomaiviti having been taken at Koro in 1926, Wakaya in 1931 and by the writer on Ovalau, Kadavu and Taveuni besides Viti Levu. It extends from New Guinea, through northern Australia to New Caledonia and Samoa [1] and attacks leaves of water-melon *Citrullus vulgaris* Schrad. besides other curcurbitaceous plants.

An outbreak of the larger *A. coffeæ* was reported this April from Ovalau and the information given in this *Journal* [2] to use one part of pyrethrum to four parts of flour or wood ashes was recommended. Calcium arsenate was sent and should be used at the rate of 1 oz. to 3 oz. of lime dissolved in 4 gallons of water. This is almost certainly the same beetle referred to in 1906 as *A. fabricii* [3] and it does not appear to have been reported as a serious pest since then though always doing some damage.

Eggs were laid in the laboratory usually on wet soil but occasionally on pumpkin leaves; they are yellow when moist, buff-coloured when dry and hatched in April and May, in fourteen days. The normal number of eggs laid at one time was thirty-six. The white larva has a dark brown anal plate dorsally placed and provided with four pairs of setæ and one pair of papillæ. The larvæ mine into the stems at ground level and feed on the tissue of the stalks.

The closely related *A. similis* Olivier though present in Fiji has not been reported as a pest here; it also occurs on pumpkins in Samoa [1].

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2. NEW HOST RECORDS OF A TERMITE.

The termite or "white ant" *Kalotermes repandus* Hill is well known as a pest of house timber and was found in Oregon floor boards in September 1941. The following month specimens were received, preserved in methylated spirits, from the Agricultural Officer North, found in living trunks of the "dogo" mangrove *Bruguiera gymnorhiza* Lank and this May the writer took all castes, including winged forms in dead stems of the ornamental bush *Acalypha wilkesiana* Müll-Arg. Termites of this genus are of the so-called "dry wood" type and it is interesting to record them from a different kind of plant material. These termites do not require any contact between their galleries and the ground so that metal caps or concrete piles offer no obstacle to their becoming established in houses to which the winged forms are often attracted by artificial light.

3. THE RICE LEAF-HOPPER *Sogata*.

The leaf-hopper of rice, *Sogata furcifera* Horv., which was shown in 1938 to cause yellowing of rice leaves[1] has been reported as a pest each year since then, invariably during March or April. Although drainage of the rice fields is the key to its control, there is a marked tendency for late-planted Motka to suffer more than the early-planted, or the varieties Patna and Sonacalif which are more resistant.

An attacked area was examined in March near Nasinu and the drainage recommended cleared up the condition; a further report came from Navua though this area could not be visited but it righted itself with a change in the weather. A third locality was Dreketi, Vanua Levu, where the disease was first reported in Fiji four years ago.

As four other species occur in the "oceanic" island of Samoa[2] it is surprising that only one species is known from the richer fauna of the larger islands of Fiji and that there was no record of this insect as a pest between 1907, when it was first collected here, and 1938.

Oviposition was watched and was found to occur between two leaf-veins; this is said to cause the orange-yellowing of the leaf.[3]

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4. FURTHER NOTES ON ECTOPARASITES OF BATS AND BIRDS.

A year ago a note appeared in this journal[1] in which the louse fly from the wild jungle fowl *Gallus gallus* (L) was given on Jepson's[2] authority, as *Ornithoctona australasiæ* F. Six months later a scholarly paper was published by Bequaert[3] from which it appears that this species is confined to Asia and New Guinea and that in Melanesia and Polynesia we are concerned with *O. plicata* (V. Olfers) known also from hawks, barn owls, pigeons and kingfishers.

The host of *Ornithoica pusilla* (Schin.) given as a hawk[1 and 2] is probably a species of *Accipiter* (sparrow hawk) and was also taken by the writer in the British Solomon Islands from this hawk besides owls, shrikes, fly-catchers, horn bills and red honey-eaters.[3]

The interesting *Myophthiria reduvoides* Rondani from nests of the cave-dwelling swift *Collocalia spodiopyga* of Fiji and Borneo is said by Bequaert to occur also on the tree-swift *C. vanicorensis* Quoy and Gaim. in both Fiji and the New Hebrides.

Proof that *Olfersia spinifera* (Leach) from the frigate or man-of-war bird is a member of the local fauna is shown by a record in this paper of a fly obtained at Naiabo Island, Lau.

The present writer has an additional parasite to add to his previous list, viz. *Nycteribosca scutellaris* Jobling from the fur of a small bat *Emballonura semicaudata* Peale taken in a cave in Colo East. This was recorded from Suva by Thompson[4] and it is interesting that the same host (bat) occurs in Samoa (where *Nycteribosca buxtoni* is parasitic on it) and also in the Marquesas Islands far to the east.

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BOTANICAL NOTES.

1. OBSERVATIONS ON PLANTS RECEIVED FOR IDENTIFICATION.

By
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THE following notes deal with some of the many plants received for identification which are of economic interest or have not hitherto been recorded in the Colony.

1. *Mimosa invisa* Mart. (Fam. Leguminosæ). Giant Sensitive Plant.

Botanical Description.—A far spreading shrub with scandent stems up to six feet in length. Stems pale green about 3 mm. in diameter, closely armed with rows of recurved spines. Leaves bipinnate, moderately sensitive to touch; leaflets small, in numerous pairs, 4–5 mm. long; petiole 5–6 cm. long. Flowers borne in globular heads about 1 cm. diameter, peduncle short, 1 cm. long. Calyx minute, corolla about 2 mm. long, stamens twice as many as petals. Fruit, short twisted pod, 1·5 to 2·5 cm. long, clothed with patches of small spines which aid distribution. Seeds 3 4, small.

The plant may be distinguished from ordinary Sensitive Plant by its large size and long, ascending angular stems, and by the bi-pinnate leaves small leaflets and by the much smaller flower heads. The foliage is of a pale green colour and the leaves less sensitive to the touch.

Origin.—Corbett (1) records that this American species was formerly employed as a cover crop of rubber in Malaysia but has a decided disadvantage in the fact that it harbours various species of insects.

Seeds of this plant would appear to have been accidentally introduced to Fiji in consignments of seed of *Centrosema pubescens* and *Calopogonium muconoides* from that region.

Distribution.—The plant has so far been recorded at Sigatoka (1940) and Tailevu (1937), in Viti Levu. In both localities it does not appear to have spread widely: but it is recorded as probably one of the worst potential weeds to have yet reached Fiji.

Status as Weed.—The plant is of robust growth, scrambling by means of the spiny stems over herbage, and forming close clumps or thickets several feet high. It flowers profusely and produces enormous numbers of small spiny pods which are admirably situated for distribution in the fur of animals, in clothing or by other similar means. There are three to four seeds in each pod and germination is rapid. Locally plants have been observed heavily infested with scale insects.

Prompt action has been taken to eradicate all known stands and publication of this note may assist in the identification and destruction of any plants which may have escaped notice.

(2) *Ischæmum rugosum* Salisb. (Fam. Gramineæ).

Common Name.—Muraina grass.

Description.—Annual grass, culms 45 to 90 cm. tall, geniculate below, nodes bearded, leaf-blades 1 to 1·25 cm. wide, sparsely pilose; racemes 5–10 cm. long, erect so closely appressed to each other as often to appear like a single spike, spikelets small, 3-4 mm. long, obtuse, the awn about 1·5 cm. long.

Origin.— An Indian grass probably introduced with seed padi. A common weed in rice fields throughout the Colony. Specimens received from Rewa, Naitasiri, Tailevu, Nadi and Labasa.

Status as a Weed.—A serious weed pest of rice land, which has spread rapidly in recent years in spite of warnings issued by the Department of Agriculture.(1)

Particularly bad in fields sown broadcast.

The young plants are very similar to the rice plant and the seeds mature with the rice crop—so that weeding is difficult—and the grass seed becomes mixed with the padi seed and is sown with it the following season.

Control of this weed is extremely difficult. Obviously only padi free from the seeds of this grass should be used for planting.

Repeated ploughing during the fallow season and the resting of the land from cultivation for one or more years so as to enable ploughing in of the grass before its seeds ripen has been advised. Indian Field Assistant Ramnath has also suggested that the early rice varieties China Patna, Ramcajara, B.G.75, etc., should be grown in infested areas, as these nature before the grass seeds are ripe and enable the rice crop to be reaped first and the grass to be immediately ploughed in. In this way clean padi seed is obtained and the ripening of the grass seed prevented. A rice padi such as Motka may also be grown if the aim is merely to obtain clean seed as this variety matures after the grass seed has ripened and fallen to the ground.

Unless dealt with rigorously and persistently this weed threatens to ruin an ever increasing area of valuable rice lands as in many cases its growth smothers the rice crop and no yields are obtained.

Control is also much assisted by transplanting rice plants from a nursery instead of broadcasting or drilling the seed. The regular spacing in a transplanted field enables thorough weeding between the stools and reduces the primary infestation due to seed contamination.

(3) *Feronia limonia* (Linn.) Swingle. (Fam. Rutaceæ).

Common Name.—Wood apple or Elephant apple.

Fijian Name.—" Vakadra "—Hindi name " Kabeet."

Locality.—Ovalau, collected by Mr. Swanston and said to have been introduced about 1880.

Description.—A small spiny tree, 30 40 feet high with glabrous 3-foliate leaves. The globular or ovoid fruit is the size of a cricket ball, with a rough woody hard shell. It contains a mass of soft, bitter-sweet, mealy substance which is used for making a cooling drink and a preserve and which is also used in native medicine.

Origin.—The tree is native of India and Ceylon.

Distribution.—In Ovalau the tree is reported to have assumed the status of a pest, the young saplings growing in dense thickets made impenetrable by the long hard thorns on the stems and branches.

(4) *Trigonella foenum-graecum,* Linn. (Fam. Leguminosæ).

Common name.—" Fenugreek," Hindi name " Methi."

Description.—An annual herb, strong scented. Leaves pinnately 3-foliate, the leaflets denticulate. Flowers white in axillary heads.

Distribution. In India the plant is largely grown for the small brown grain-like aromatic seeds which are used as a condiment and in curries, and also as medicine and for dye. The plant is occasionally grown locally as a vegetable, the young leaves and pods being cooked as spinach.

(5) *Homalium vitiense,* Benth. (Fam. Samydaceæ).

Native name.—" Molaca."

Locality.—This native tree, which grows to a height of 40 feet, is (owing to the long *Garrya*-like racemes of cream or pink flowers) a conspicuous feature of the forests along Queen's Road and elsewhere in Viti Levu during the month of April.

Description.—A glabrous tree, leaves broadly ovate, obtuse, irregularly sinuate-crenate or undulate, 5–10 cm. long, petioles ½ to 1 cm. long. Flowers almost sessile, in simple or branched spikes often 25 to 40 cm. long. Calyx-tube narrow-turbinate about 2 mm. long, lobes 8 or 10, linear; petals as many. Stamens in pairs or 3 together, opposite each petal.

Distribution.—Native of Fiji, also in New Caledonia and Queensland.

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2. CLIMBING PLANTS SUITABLE FOR CAMOUFLAGE.

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THE following are listed as probably the most useful for the purpose of camouflage, having regard to the necessity for rapid cover being established, to the varying situations and to the desirability of using such plants as will not be noticeably different in colour or appearance from the surrounding vegetation. For the last mentioned reason preference is given to indigenous or well-established naturalized species. The plants recommended are grouped for the main situations coming within the definition of sea coast.

I. Plants suitable for sandy beach (exposed to sea, winds and spray):—

Ipomœa pes-capræ.—Far-spreading prostrate creeper and sand-binder. Stems over 30 feet long.

Vigna lutea.—Strong growing prostrate creeper forming dense cover.

Canavalia obtusifolia.—Large climber.

Triumfetta procumbens.—Succulent creeper and sand-binder.

Stenotaphrum americanum.—Mat-forming robust grass.

Thuarea sarmentosa.—Sand-binding grass.

Digitaria longiflora.—Sand-binding grass.

Derris ulginosa.—Prostrate creeper or high climbing vine.

Cassytha filiformis.—Climbing parasite.

Scsuvium postulacastum, Postulaca oleracea.—Prostrate spreading habit suitable for ground cover.

II. Plants suitable for intermediate zone between beach and higher land:—

Entada scandens.—Giant creeper and climber.

Mikania scandens.—Rapid growing succulent far spreading climber.

Pachyrhizus erosus.—Large creeper and climber.

Derris uliginosa and *D. eliptica.*—Wood vines.

Canavalia spp., *Colubrina asiatica.*

Ipomœa insularis and *I.* spp.—Large rapid-growing climbers.

Calapogonium muconoides.—Far-spreading cover forming vines, especially good on account of foliage colour.

Desmodium triflorum, Passiflora fœtida, Peanut grass.—Useful ground cover.

III. Shrubby plants suitable for both situations I and II:—

Leucœna glauca.—Fine foliage: may be propagated by stake cuttings or seeds.

Kau ni yalewa, *Sophora tomentosa, Gliricidia sepia,* and *Herpetica alata.*—Propagated by stake cuttings, growth rapid.

Mexican sunflower.—Shrubby—grows rapidly from seed.

3. WEEDS IN FIJI—IV.

By
B. E. V. PARHAM, M.A.
Agricultural Officer (Plant Pathology).

I.—*Hyptis pectinata* (Linn.) Poit. Family Labiatæ.
Common name—" Mint weed."

Description.

A coarse herb—growing up to six feet high with erect densely puberulent stems.

Leaves ovate, 1 2 inches long bluntly and unevenly serrate, green and faintly puberulent below, acute at apex, usually obtuse at base with petioles up to ½ inch long.

Flowers sub-sessile in one sided, spiked cymules, forming elongate inflorescences.

Calyx small 1/6 inch long with awn-shaped straight lobes nearly as long as the tube. Corolla white to pale purplish, little longer than calyx.

Nut oblong, black, smooth, very small.

Distribution.—Native of Central and South America, now widely distributed and common in waste lands in the tropics.

Locally this plant has spread rapidly in Rewa, Naitasiri and Tailevu Provinces.

It is very common on the King's Road between Suva and Rewa and has in recent years become prominent in the Namalata (Korovou) district in Tailevu.

Also reported in Taveuni.

Status as a weed.—The plant is a perennial with a high seed productivity, is of robust and rapid growth and competes with Para-grass and other low growth. It is not eaten by stock and is regarded as a pest by dairy farmers.

Effective control of this plant is necessary—and involves rooting up and burning—it favours damp places and good soil, and should not prove difficult to eradicate in efficiently managed pasture lands.

II.—*Elephantopus mollis* H.B.K. (Family Compositæ).
Common name—" False Tobacco."

Botanical description.—A tall pubescent perennial herb three feet or more in height—leaves alternate sessile, obovate, 4 inches long, 2 inches in width, crenate. Flowers in heads composed of 2 to 5 or more small tubular flowers; involucral bracts lanceolate, acute about ½ inch long; corolla tubular; narrow, nearly ¼ inch long—white or very pale pink; corolla 5-lobed, anthers sagittate at base; pappus bristles few, dilated at the base filiform above. Achenes narrowly obcuneate, less than ½ inch long—truncate at apex, 10-costate, pubescent, crowned with a pappus of rigid setæ.

Distribution.—A tropical American weed, now widely spread in the Pacific.

In Fiji first recorded by Barnes in 1930(1) under the name *Eleophantis scaber*.

Locally common in Naitasiri, and reported by the Agricultural Officer, Central (W. L. Parham), as follows:—

Dense growth on a farm at Korovou, also on King's Road at Waidaleci (roadside), Ra and Colo East (Navucini and Naitavoli along native tracks) where the natives regard it as a new weed.

Status as a weed.—Barnes (l.c.) lists the plant as a noxious weed and it should be regarded as such in grazing areas. It grows with vigour even in poor soils and produces large numbers of minute pappus-crowned seeds; and unless checked in early stages is likely to be a nuisance. Stock do not eat it.

REFERENCE.

(1) Barnes, A. C.—1930. *Agric. Journ*, Fiji, Vol. 3, No. 3.

4. CANES, REEDS AND BAMBOOS SUITABLE FOR INSTITUTES FOR THE BLIND.

By
B. E. V. PARHAM, M.A.,
Agricultural Officer (Plant Pathology).

THESE notes were prepared in reply to a request for information and are printed in the *Journal* as being of general interest.

Prices mentioned are estimated approximate costs for the material delivered Suva. As this type of product has not been handled before for export, exact figures are not available and could only be ascertained by actual trial.

BAMBOOS.

1. *Large bamboo*—available in lengths up to 40 feet. Supply abundant. Price 2s. per 100 feet.

2. *Native bamboos*—length up to 30 feet—diameter from 1"-2½", smaller, stronger and more durable than 1. Supply abundant. Price 1s. per 100 feet. Round and split bamboos have a great many uses locally.

Note.—Limited supplies of a very strong variegated variety of bamboo with stems not over one inch diameter are available, but no specimen could be obtained in time to forward.

3. *Japanese bamboo*—a dwarf bamboo—stems not exceeding 10 feet long—diameter from ¼ to ¾ inch. Limited supply—Price 1s. per 100 feet (in 6 foot lengths).

REEDS.

4. *Fijian Reed*—average length (untapered) 6 8 feet—diameter ½ inch or less—abundant. Price 1s. per bundle of 120 (in 6ft. lengths). When scraped makes excellent material for certain purposes.

5. *Giant Reed* (*Arundo donax*)—stems up to 18 feet long, very uniform. Said to be used in Palestine for making reed baskets, in Europe for reeds of clarinets and organ pipes, in America for lattices, mats and screens. Moderately plentiful—price 1s. per bundle of 36 (in 12ft. lengths.

CANES.

(All used locally for basket-making).

6. *Flagellaria indica*—stems up to 60 feet long—uniform throughout—average diameter 1 inch. Moderately plentiful. Price 1s. per 100 feet.

"QANUA."

7. Stems up to 100 feet uniform—diameter ¾ inch—flexible and bends well to retain shape. Price 2s. 6d. per 100 feet. (dry samples).

"WAKATA."

8. *Flagellaria* sp.—stems 30 to 40 feet long—diameter not exceeding ½ inch—fairly abundant in some areas. Price 6d. per 100 feet.

9. *Flagellaria* sp. a very much smaller rattan with long flexuous stems less than ¼" diameter. Abundant in some areas. Price 6d. per 100 feet.

"WA ME."

10. *Freycinetia storckii*—very flexible. Price 1s. per 100 feet.

It may be mentioned that the following species occur locally but specimens are not available at the moment:—

(*a*) *Dæmonorops* sp.—a climbing palm with long stems about ½" diameter—used for baskets, fish traps, etc.

(*b*) *Carludovica palmata*, used in Central America for making Panama hats, and in Trinidad for Mamoo baskets. Supplies would have to be worked up.

(*c*) *Cyperus papyrus* is available in fair quantity.

(*d*) *Pandanus* leaves make serviceable baskets and mats. Available in prepared rolls of material—three feet lengths by 1½"–2" wide. Price 4s. per 100 leaves.

OBITUARY

Sir ARTHUR HILL, K.C.M.G., F.R.S.

THE tragic death of Sir Arthur Hill, Director of the Royal Botantic Gardens, Kew, in a riding accident on November 3, 1941, is not only a disaster for the Gardens but also a great loss to the many societies, institutions and Government departments of which he was the chief representative of official botany for Great Britain. The twenty-odd years during which he was Director saw a tremendous advance in the progress of botanical science in all its branches, and it was natural that Kew should play a prominent part in many of the activities characteristic of this period.

He was appointed Assistant Director of Kew Gardens in 1907 under the great Sir David Prain whom he succeeded in 1922. In spite of his numerous and onerous routine duties Hill continued his taxonomic research work, publishing many papers and took a large share in the preparation of several floras notably the "Flora Capensis" and the "Tropical Flora of Africa," etc.

Sir Arthur travelled widely in his official capacity and his unique knowledge of conditions in the Colonies and Dominions was in constant demand on the many committees on which he served with distinction.

He was keenly interested in agricultural education and was one of the original governors of the Imperial College of Tropical Agriculture in Trinidad. His general hospitality in his official residence was well known to botanists from all parts of the world and his constant cheeriness, sympathetic helpfulness and inostentatious generosity endeared him to all with whom he came into contact.

Kew has been the source of inspection to all botanists in the Empire for the last 100 years and Hill's many tours and personal correspondence did much to preserve the links that tie it to so many of the botanical institutions that have sprung up overseas.

He was an ideal Director and his death will leave a vacancy that will be difficult to fill.

With acknowledgments to *Nature*, Nov. 22nd, 1941.

COCONUT NOTES.

1. COCONUT HUSK AS A SOURCE OF FERTILIZER.

Writing in the *Malayan Agricultural Journal* for November, 1941, Vol. 29, No. 11, Mr. C. D. V. Georgi, Chief Research Officer, in carrying out experiments on alternative methods of obtaining potash fertilizers, concluded that the loss of husks for some years on coconut estates would not have any appreciable adverse effect on the palms.

If the husks are incinerated in order to produce ash for use as a fertilizer the practice would, on an average estate, result in a loss of 47 lb of potassium calculated as K_2O per acre per annum, which would be equivalent to a dressing of 2 lb of sulphate of potash per palm per annum. Most coconut estates in Malaya are situated on coastal clay soils which are normally rich in potash. Such soils have not shown any significant response to potassic manures and hence it is considered that coconut husks might well be used for the production of potassium fertilizer during war conditions.

—H.W.J.

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2. COCONUT RECIPES.

COCONUT BUTTER.

Coconut butter is being very largely used in place of dairy butter in the United Kingdom and France, and, before the war, it was largely used in Germany. It can be used wherever dairy butter is used. Here is the process:—Grate or grind in a mill the meat of the nut as fine as it can be ground, and for the meat of each average nut add a pint of boiling water. Put this in a press, so that the milk can be squeezed out separate from the pulp. This milk can be used in place of cow's milk for any purpose, and is specially good with stewed fruit. To make butter, this milk can be separated in a separator or let stand in a pan to let the cream rise, which it should do in about the same time as the cream in cow's jmilk. This can be set to to ripen and churned in the usual way. The whole process is in every respect the same as in making dairy butter. Wash out the buttermilk; add salt to taste. As a rule, this butter is white, and annatto colouring can be added. According to the size of the nuts, it should take from six to ten nuts to make 1 lb of butter. The churning should be done in a cool temperature, say, between 60 to 70 degrees.

COCONUT RICE.

To the grated meat of one coconut add two cups of hot water; squeeze this in a strainer cloth and add sufficient water to make four cups of liquid; add four tablespoons of sugar, a spoonsful of ginger, and two cups of rice; cook in a double boiler for nearly one hour. Serve for dessert. (In Spanish America, ginger is almost always added to coconut dishes; it promotes digestion.)

COCONUT AND TAPIOCA PUDDING.

Mix one cup of " minute tapioca " with four tablespoons of grated coconut " meat," the yolks of four eggs well beaten, one cup of white sugar and one litre of " natural " tinned or dairy milk. Bake for one-half hour and add meringue made of the whites of four eggs and three tablespoons of sugar.

New Guinea Agricultural Gazette, November, 1941.

3. PICKING VERSUS NATURAL FALL IN COCONUT HARVESTING.

In the main eastern copra producing areas, it has always been the custom to pick the ripe nuts from the palms at regular intervals—six weeks being regarded as the ideal interval.

In view of the copra depression of the past decade experimental data were collected over a series of years which showed no significant difference between the numbers of nuts which fell naturally from the palms and the numbers of nuts which could be collected from palms growing under comparable conditions.

In yield of copra, however, the picking of the nuts from the palms resulted in an increase in the weight of copra per unit area compared with nuts which had fallen naturally from palms growing under similar conditions.

Obviously the decreased return in copra from nuts which had fallen naturally was due to the material percentage of germination which is always found in such nuts. In the experiments in question, it was found that of all the nuts which were allowed to fall naturally 28 per cent had already germinated.

This percentage was found where nut collections were made at regular monthly intervals—at longer intervals the percentage of germinations would certainly have been much higher. In the same experiment the nuts picked from the palms showed a negligible amount of germination, the proportion being less than one per cent. —H.W.J.

Simpson, H. J.—1941. *Malayan Agric. Jour.* Vol. XXIX, No. 60, October.

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4. COPRA QUALITY.

Now that the maximum output of copra is required as a war effort, attention should be given to the curing of the copra so as to secure the utmost quantity of high grade produce. Low grade copra means a definite and material loss to the producer. Each producer can prove this to his own satisfaction by collecting 2,000 nuts, dividing them equally and producing copra from each lot of 1,000 nuts separately. With one lot reasonable care should be taken to make good copra only; with the second lot indifferent copra should be made—irregular drying, exposure to rain or dew, etc. It will be found that the weight of the copra made carefully from the one lot will materially outweigh the copra which was made carelessly—in fact the loss in making poor copra may, in bad cases, amount to 25—30 per cent or even more, after a period of one or two months have elapsed. The initial material was the same in each case so that the loss is entirely due to lack of attention to methods or procedure in curing the copra. The loss due to making bad copra does not affect the merchant or the manufacturer—it affects only the producer. Hence each producer should strive to reduce his losses on manufacture as much as possible and thus secure the maximum remuneration for his produce. Much loss can be obviated with the exercise of a little more care and better supervision coupled with improvements to available drying equipment. —H.W.J.

5. THE POTASH CONTENT OF COCONUT HUSKS AND HUSK ASH.

In the *Tropical Agriculturist* of August 1941 (Vol. 97, No. 2), Salgado and Chinnarasa have shown that the potash content of 1,000 coconut husks averages 3·47 lb. When the husks are taken from palms growing in soil to which potassic fertilizer had been applied (3 lb of muriate of potash per palm) it was found that the average potash content of 1,000 husks was 5·67 lb thus showing that the potash content of the husks was directly proportional to the potash status of the soil.

A wide range of variation in potash content of husks was found from both husks from palms grown in unmanured and manured soils. It was also found that the potash content of husks correlated closely with the potash content of the corresponding husk ash.

As potash salts are likely to be lost by volatilization at high temperatures, the burning of husks to produce potash manure is best conducted in shallow pits about two feet deep where burning will be comparatively slow. Burned in this manner the ash is obtained ni a fine dry powder with a high potash content. —H.W.J.

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6. THE CONVERSION OF COCONUT OIL INTO A SOLID CRYSTALLINE MASS.

While engaged in the study of thermal decomposition of coconut oil, J. Banzon (*The Philippine Agriculturist* Vol., XXVI, No. 5, p. 399) observed that a particular catalyst had the unique property of converting coconut oil into a crystalline solid mass.

The process is the simple distillation of coconut oil with ferric oxide or finely divided iron. The distillate thus obtained is dark-yellowish with a bluish fluorescence. On cooling, it sets to a crystalline greenish-yellowish mass, which may be purified by reprated washings with methylated spirits.

The purified product is a light, white, crystalline powder, tasteless, and with a faint odour similar to stearic acid. It melts sharply at 55°C., to a clear transparent, colourless liquid, and solidifies to a hard, rather brittle, crystalline solid. Owing to its close resemblance to paraffin, this solid may possibly be used interchangeably with the latter, as, for example, in candle-making. —H.W.J.

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7. THE MANUFACTURE OF COCONUT OIL FROM FRESH COCONUT MEAT.

An interesting account of a process for extracting oil directly from fresh coconut meat without its conversion into copra, is given in the Philippine *Coconut Journal* by Pedro E. Torres.

The author claims that oil extraction from copra suffers from several disadvantages of which the chief are:—

(1) Despite utmost care in handling and storage, the oil produced always contains free fatty acids and is usually discolcured thereby requiring additional refining operations.

(2) The only by-products are copra meal and cake which are dirty and become rancid and can only be used for animal feeds.

He describes the necessary processes for direct oil extraction in chronological order and indicates types of equipment already in use for other common industries, that may be used for each purpose. He also indicates uses for by-products. Claims are made that the process is commercially feasible but no manufacturing costs are mentioned. A copy of the article concerned will be made available to any interested applicants. —H.W.J.

EXTRACTS.

1. GRASSLAND RESEARCH.

The trend of agricultural policy in many parts of the Colonial Empire during recent years has been towards the establishment of a more settled and permanent system of agriculture. It is generally agreed that the successful development of such a policy should be linked up with the introduction of a suitable system of mixed farming to replace various systems of agriculture which, by exploiting the large stores of fertility of virgin tropical soils, have brought about in many places widespread and progressive soil exhaustion and erosion. Mixed farming is advocated to-day largely because it involves keeping part of the land under a soil-recuperative cover of perennial grasses or forage crops on the assumption that this will restore to worn out soils not only the physical and biological characteristics associated with good land but also that granular structure which has been described as the " only structure having any agricultural value at all." By combining live stock with arable crops, mixed farming also provides for a ready supply of organic manure for the arable fields. In short, it is a system designed to ensure the maintenance of soil fertility; and since it is likely to occupy an important place in the permanent agricultural systems of the future much more attention has recently been paid to grass and forage crops in view of their potentialities as makers and conservers of soil fertility.

It must be admitted that in the tropics grassland research is one of the younger branches of agricultural science and that its position still lags a good way behind that obtaining in the temperate zone. For reasons which we have already given there has of late been, even in the tropics, a more progressive attitude towards grassland problems. Investigations have already shown that the general principles of the good management of live stock and arable land in temperate regions apply also to tropical conditions but that in the tropics there is still much to learn about the best methods of putting these principles to practical use. In the wet tropics, for example, the exact influence on soil fertility of cultivated grass crops under varying field conditions still remains to be assessed. So far it has also not been possible to produce economically a good semi-permanent pasturage of mixed sward equivalent in quality to a first grade English ley although it is hoped that this will eventually be achieved when more is known about the ecological conditions necessary for the establishment and maintenance of permanent pastures under tropical conditions. On the other hand, surveys of the natural vegetation, including the regional classification of grasslands, have already been made in several Colonies where, through the study of the indigenous flora, considerable progress is reported in the isolation of pasture plants for the establishment of cultivated grass crops in rotation with arable crops. The discovery of suitable leguminous plants for establishing in mixture with grasses has, however, proved much more difficult and although for some areas such plants are available, much further work in the direction is necessary. Useful investigations have also been carried out on the management of natural grassland types and on individual species with a view to the improvement of such pastures.

" *Tropical Agriculture*," Trinidad. Vol. XVIII, No. 10, Oct., 1941.

2. NATIVE CULTIVATION.

On a recent visit to Dawasamu excellent native cultivations were seen. These were the holdings of 17 individual farmers. Extensive and very fertile flats were well ploughed, harrowed and otherwise prepared and rice planting was following crops of peanuts, horse traction being entirely used. These settlers in last season produced over 100 bags of padi and over 200 bags of peanuts in addition to maize, varied and abundant native food crops and several had cows, pigs and poultry in addition. Their houses had all been rebuilt since the hurricane in February and were substantial, confortable and provided with adequate ventilation. All but two had families and the women and children appeared to be very well fed and healthy. All the farmers had already paid their taxes. The Buli is to be congratulated on his successful practical co-operation with the settlers who are obviously healthy and contented and prosperous. —H.W.J.

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3. RESERVE BANK OF THE SOIL.

All these activities are carried on mainly in the humus content of the soil. This vast storehouse results from the breaking down of waste vegetable material of all sorts. It may result from the normal processes of nature, from the decay of leaves in the forest, or of grass on the hillside, or it can be produced artificially by oxidation of waste animal or vegetable matter in the compost heap or the activated sludge tank. Humus may be said to envelop each granule of arable soil, It is indeed the Reserve Bank of the soil. If this reserve is depleted there is ultimate agricultural bankruptcy. It is necessary, therefore, to guard against too heavy overdrafts on this bank. When these are demanded over a prolonged period the result is disease as is shown in the " dust bowls " of western America and the deserts of Mesopotamia.

(Gilbert J. Fowler, D.Sc., F.I.C., F.R.San.I., F.N.I. *Indian Farming* Vol. II, No. 12, December, 1941.)

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4. THE NITROGEN CONTENT OF RAIN.

In various tropical areas efforts have been made to estimate the nitrogen content of rain at various times. Koch records in the *Tropical Agriculturist*, Vol. 97, No. 2 for August, 1941, that Leathen found the average annual precipitation of nitrogen in the rain in two widely separated areas in India was 3·3 lb per acre. Corbet in Malaya estimated the figure at 9 to 11 lb per acre. Koch himself in Ceylon recorded as much as 12·85 lb per acre of inorganic nitrogen of which nearly 7·5 lb was in the form of ammonia. He also states that the total amount of nitrogenous matter depends on the total quantity of the rainfall and also on the extent to which matter in the atmosphere had previously been worked out by rain. He, however, also maintains that though most nitrogen is precipitated where rainfall is high, a great part of such precipitation is lost to the soil by surface run off hence the amount available to plants will be appreciably smaller. The prevention of run off by sound agricultural methods is thus important. —H.W.J.

5. TESTING POISON GAS IN NEW ZEALAND.

A group of chemists, headed by the Government Analyst, Mr. K. M. Griffin, and including five of his staff, ten other industrial chemists and two from Auckland University College, form the vanguard of the poison gas protection organization in Auckland. These experts are instructing E.P.S. groups in detection, control and decontamination methods, and with a view to gaining thorough first-hand knowledge of the various forms of gas that may be employed by an enemy, the chemists exposed themselves to the effects of two gases, known as D.M. and C.A.P.

D.M. is fired in shells and C.A.P. is a tear gas generally used with the more deadly mustard gas. The number of poisonous or irritant volatile substances answering the requirements of military uses in the Great War was between 45 and 50, but only a few of these were used in quantity or for any length of time. The basis of nearly all the gases likely to be employed by an invading force is either chlorine or arsenic, but no fewer than 3,000 substances were submitted to chemical research between 1915 and 1918 with a view to testing their suitability for chemical warfare.

Tests were made last week by the experimental group, who entered sealed rooms in the offices of the Government Analyst. The first entered the rooms wearing service gas masks, by which they were thoroughly protected from D.M. and C.A.P. gases. They then removed the masks and tested the presence of the gases by their smell and the effects on the human system. After suffering a great deal of discomfort they recovered. The experiments will be continued and their experiences will soon be made available to all citizens through the E.P.S. decontamination and Red Cross organizations.

—*Auckland Weekly News*, January 21st, 1942.

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6. QUALITY IN RICE.

(*a*) *Factors tending to lower the food-value of Rice.*—The poor quality of the rice eaten by a large section of the population is traceable to (i) the prevailing taste for fine, white, and small or long-grained varieties; (ii) the process of polishing, which removes the major part of the protein and phosphorus compounds as well as the essential vitamin; (iii) the practice of thorough washing before cooking, which removes a further part of the residual bran; and (iv) the present method of cooking, involving loss of gruel containing essential food ingredients.

(*b*) *Rice v. Wheat.*—It has been frequently stated that wheat is more health-sustaining than rice. If, however, the comparison be made on the basis of identical dietary proportions of the whole (unpolished) grains, rice approaches wheat in nutritive value. Although wheat is richer in proteins and minerals, rice protein is more assimilable. Also, varieties of rice compare favourably with wheat in regard to composition, and it is possible to enhance to some extent, the nutritive value of rice by manuring. As a staple food rice has a higher calorific value than wheat, although rice, when ready for consumption, is bulkier and contains more water than a quantity of wheat of equal calorific value; the higher water-content of rice may be advantageous in a tropical climate, since it provides a better reservoir of water for skin evaporation and urine secretion thus regulating body-temperature.

(*c*) *Why polished Rice is favoured.*—The one feature that distinguishes rice from wheat and all other cereals is that it is predominantly consumed in the polished state. In spite of the food-value it loses by polishing, polished rice is nearly everywhere preferred. The reason is not far to seek. Polished rice has a pleasing appearance and texture, it cooks more easily than the unpolished grain, and in the raw condition it keeps far better and can be

stored for long periods or transported over long distances without appreciable deterioration. The last quality is the one which appeals to the largest section of both producers and consumers. It is, in fact, the chief reason which militates against the introduction of any major legislation to check the wholesale replacement of unpolished rice by the polished product. The poor keeping-quality of unpolished rice is essentially due to the rice oil contained in the embryo and the outer integuments of the grain. It is possible, by suitable control of humidity and storage, to prevent or minimize the deterioration of hulled rice on storage but there is great need for evolving improved methods that are readily applicable in practice.

It may not be quite practical to ask people to go back to hand-pounded rice, but even a lower degree of milling would do a great deal of good. It should be possible, by proper control measures and propaganda, to check the wholesale displacement of unmilled rice by the highly milled product, and to encourage undermilling. The League of Nations Inter-Governmental Conference on Rural Hygiene has rightly emphasized that "the problem of nutrition throughout the East is intimately connected with the degree of milling to which rice is subjected before being consumed."

Although rice is mainly consumed as cooked grains, there are certain localities where pancakes are prepared from the flour. As this method of preparation necessarily does away with the washing and cooking losses, there is much to be said in its favour.

(*d*) *Rice Bran as food.*—Another line of improvement would be to popularize the use of rice bran as an article of food. Bran flours are considered to be quite nutritious and are very popular in the United States and elsewhere. This would naturally suggest the use of rice-polishings for human consumption, especially as they are very much cheaper than the flour. The reason that rice bran has not become popular is that it contains a vegetable fatty oil which becomes rancid if the bran is stored indifferently. The most convenient method for preserving rice polish is to heat it when fresh at 50°–60° C., and then keep it in moisture-proof containers. Heating removes some moisture, stops the destructive action of enzymes, destroys any mould spores, insects, or insect eggs which may be present in the bran, but does not affect the vitamin. Bran treated in this manner has a pleasant flavour which, if necessary, can be diluted or toned down by suitable additions of wheat or other flour. Such mixtures of bran and flour can be used for preparing a variety of food articles, such as bread, cakes, pastries, and biscuits. Indeed, rice bran exported from India in large quantities, is used for such purposes.

(*e*) *Rice in a well-balanced diet.*—Suitable proportions of meat, milk, eggs, butter, vegetables, fruits and other protective foods will no doubt supply essential dietary elements lacking in polished rice. They cannot, however, always be had, either on account of poverty or for sentimental reasons, so that other cheap and adequate accessories must be found and be intelligently incorporated in the food. The use of rice bran as food would help to supply the deficiency present in diets consisting largely of polished rice. Increased use of whole, unmilled, or under-milled rice, especially from coloured or coarse varieties known to be rich in nutrients will also greatly improve the customary rice diet, and will result in better growth and greater improvement in the general health and well-being of the rice-eating peoples.

(In one area in Malaya rice polishings, mixed with double their quantity of wheaten flour, were used to make palatable and nutritious bread.) H.W.J.

Screenivsan, A., 1941. *Empire Journal of Experimental Agriculture*, Vol. 9, No. 35, July.

7. LIME AS A BUILDING MATERIAL.

A. Leander St. C. Byles.

Lime mortar possesses certain qualities of workability that are superior to cement mixtures or plasters but is lacking in strength. It can regain many of its former uses if its strength can be increased. We are told that all of the old masonry structures erected in this Island (Jamaica) in the dark days of slavery, of which many are still standing and still in use, were constructed with lime mortar sweetened with molasses. Encyclopedias state that the Romans sugared their mortar. In fact from statements 2,000 years old that have ranked as little more than tradition, scientists such as Dr. Gerald J. Cox and Dr. John Metshi of the Melon Institute of Industrial Research have shown that mortar bricks, with their strength increased 60 per cent simply by sweetening them like coffee, were a cheap and practical building material. This industrial use for table sugar was shown to the American Chemical Society in March, 1932. Controlled tests have proven that if as little as 6 per cent of the quicklime is included in the mortar, the tensile strength is increased about 60 per cent. With the present low price of sugar the addition of six pounds of sugar for each 100 lb of lime adds very little to the cost of laying bricks or building or plastering walls. The sugar is added dissolved in water after the lime has been slaked.

MIXING OF LIME MORTAR.

The most popular and economical mixture for lime mortar for the building of walls is in the proportion of one part of lime (slaked), called the binder, and three parts of fine sand, marl or red-loam, called the fine aggregate. The binder and fine aggregate must be thoroughly mixed with necessary water by a hoe fitted to a long stick, at least two weeks before the date to be used. This mixture should be heaped and covered. The common practice of mixing with a shovel as is done in Portland cement mortar is not recommended. The mortar is softened at the time of using by re-mixing with thick lime-wash instead of plain water as in the first instance. The substitution of one-half part of ashes to the above mixture, especially when sand is used as the fine aggregate, will be found to be an improvement to the mixture. For walls that call for a greater tensile strength than can be obtained with the above ordinary lime mortar, 5 to 6 lb of " Brown Albion " sugar dissolved and added to each 100 lb of the lime at the time of mixing will be found to increase the strength of the mortar some 60 per cent. This mixture will be found admirable for Random Rubble masonry walls for all purposes, nog walls and laying of bricks.

LIME MORTAR PLASTER.

The mortar for plastering walls should be mixed and treated in the same way as the building mortar, but preferably with sand or good marl, as the fine aggregate, that has been passed through a $\frac{1}{8}$" screen. This mortar is known as the " rough cast plaster " and is applied evenly to the face walls not less than $\frac{1}{2}$" thick with a wooden float after the walls have been damped with water or lime wash. The plaster is left to dry for at least four days when it is again plastered with a " putty mortar " specially prepared for the purpose and applied with a steel float and rubbed to an eggshell finish. This putty or finishing coat is generally from 1/16" to 1/8" in thickness.

Cow hair added and properly mixed in the rough cast mortar at the time of mixing in the proportion of one pound to 3 cubic feet of the mortar will greatly improve the plaster, especially on exterior walls, and give it a tying

or keying quality. Wool may be used, but hair is best. The hair should be of medium length, it may be long but not lumpy. Before it is mixed in the mortar, it should be thoroughly beaten until the matted portions are evenly separated. Sawdust is also sometimes used in this class of mortar for plastering outside walls to offset the action of water and prevent the plaster scaling. However it should be free from chips and shavings.

—Journ. Agric. Society, Jamaica. vol. 45, Oct., 1941.

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8. PISE DE TERRE.

Pisé de terre is rammed-earth construction and must not be confused with mud-walling which is carried out in several parts of this Island (Jamaica). Wet, soft earth has no place in pisé de terre practice.

In building a pisé de terre wall, parallel wooden shutters are erected on the selected site, the distance between the shutters being the width of the wall required. "A layer of fine earth (not mud) four to five inches deep is spread evenly between the shutters. This earth is well rammed with wooden rammers till they fail to make an impression upon it. Similar layers of earth are spread and rammed until the top of the shuttering is reached. The shutters are immediately dismantled and set up for the next section. The full height of the wall is reached by placing the shutters on the courses of the wall already completed. Several sets of shutters may be in use at the same time, for as soon as two sections of the first course are ready the second course can be commenced. When two sections of the second course are ready the third course can be commenced and so on. The work thus progresses in a series of steps which eliminates the necessity for ladders or scaffolding."

Walls of pisé de terre can be made entirely by unskilled labour supervised by an ordinary mason to use the plumb line to keep the moulds upright; and considerable savings can be effected when the costs of other forms of construction are borne in mind. The most important point is good ramming; if soil of the right consistency is used and the ramming is well and truly done very durable walls and buildings can be made.

The walls should be allowed to dry out for about two weeks before they are finished off with plaster. Driving rains should have little effect on these if they are properly plastered and they are highly resistant to termite attack.

—Journ. Agric. Society, Jamaica, Vol. 45, Oct., 1941.

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9. INSECTS AND MILITARY EQUIPMENT.

THE Entomological branch has been doing direct war work on the identification and treatment of insects attacking timber and bamboos in the forests before the wood reaches the depots, and in the various war supply depots and arsenals throughout the country in close co-operation with the timber Directorate and Ordnance, besides advice to the important plywood industry. It need hardly be emphasized how extremely important it is that army supplies, especially overseas supplies, should reach their destination sound and not rotten. A certificate that timber and packing material leaves the country free from borers is essential if attacks are to be controlled.

—Indian Forest Research Institute, Empire Forestry Journal, Vol. 20, No. 2, 1941.